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LIVER FLUKE

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IN CATTLE

U. S. DEPARTMENT
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LEAFLET NO. 493

LIVER FLUKES IN CATTLE

Liver flukes are parasitic worms that infect the livers of cattle, sheep, goats, wild rabbits, deer, elk, and other warmblooded animals.

The common liver fluke (*Fasciola hepatica*), which is the most widespread of the cattle liver parasites in the continental United States, has also been reported from Hawaii. The giant liver fluke (*Fasciola gigantica*) occurs in Hawaii. The two flukes have similar life cycles, and methods of control are the same.

At least two other species of liver flukes occasionally occur in cattle in the United States. They are the large American fluke (*Fascioloides magna*), which primarily is a parasite of deer and related animals; and the lancelet fluke (*Dicrocoelium dendriticum*), which occurs only in New York and limited areas of adjoining States. Because they are not major parasites of cattle, neither the large American fluke nor the lancelet fluke is discussed here.

Both common liver flukes and giant liver flukes begin their development in fresh-water snails and complete their lives in the body of a warmblooded animal. They live in the liver, where they gradually destroy tissues. In some areas, infected cattle lose weight and become unthrifty; calves may die from severe fluke infections.

Cattle livers that show signs of fluke damage are routinely condemned as unfit for human food under Federal meat inspection laws. Condemnation of fluky livers reduces the value of American cattle by an estimated \$1.5 million annually.

The common liver fluke infects cattle in all of the Gulf States except Mississippi, the Pacific States, the Mountain States, and Arkansas. It has been found in Michigan and Wisconsin.

The giant liver fluke infects cattle in Hawaii.

Cattle can be profitably raised in many fluky areas. Regular treatment of animals or control of snails—or both—are necessary in some localities. In the gulf coast of Texas, snails are extremely difficult to control.

HOW CATTLE GET FLUKES

Before they can infect a warmblooded animal, the common liver fluke and the giant liver fluke must develop in the body of their intermediate host—a fresh-water snail. Seven of the species of fresh-water snails that occur in the continental United States and one fresh-water snail that occurs in Hawaii are suitable hosts.

These long-lived snails live in wet-weather springs, in slow-moving fresh water, in stagnant water, on swampy and marshy lands, on the banks of ponds, streams, and ditches, and in mud. Several species survive in high altitudes.

After they have completed their development in the snail, flukes form tiny cysts on grass or on water. Cattle become infected with flukes when they eat grass or drink water containing these cysts.

Cattle cannot become infected by contact with fluky cattle or other animals. Fluke infection is called fascioliasis.

HOW FLUKES GROW

Conditions in many fluke-free areas seem favorable to the development of the parasite. Every section of the United States has at least one species of snail in which flukes can develop. This widespread distribution of suitable snails may lead to future spread of liver flukes to the rest of the 50 States.

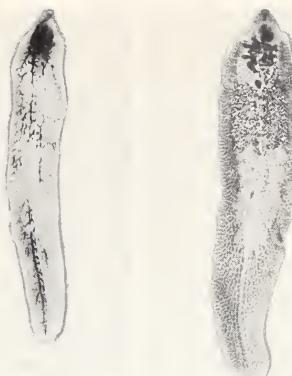
The common liver fluke is a flat, brownish, leaf-shaped worm that has two suckers. At maturity, a common fluke usually reaches a length of about 1½ inches.

The giant liver fluke is similar to the common liver fluke, except in size. It reaches a length of 2 inches.

Normally, these flukes live in bile ducts of the host's liver, but they also may occur in the lungs.

In its complex life cycle—

- An adult fluke lays thousands of microscopic eggs, which leave the animal's body in droppings. If these eggs reach water or moist soil when the temperature is above 45° F., they will hatch in about 2 weeks.
- A microscopic embryo emerges from the egg and swims about until it finds a fresh-water snail in which to live. If it does not find a suitable snail, it will die in 24 hours.
- The embryo fluke cannot complete its life cycle unless it inhabits a suitable snail. When it finds one, it penetrates the soft parts of the



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Giant liver flukes (stained, natural size).

snail's body. During its 4½ to 7 weeks in the snail, each embryo fluke produces several larvae.

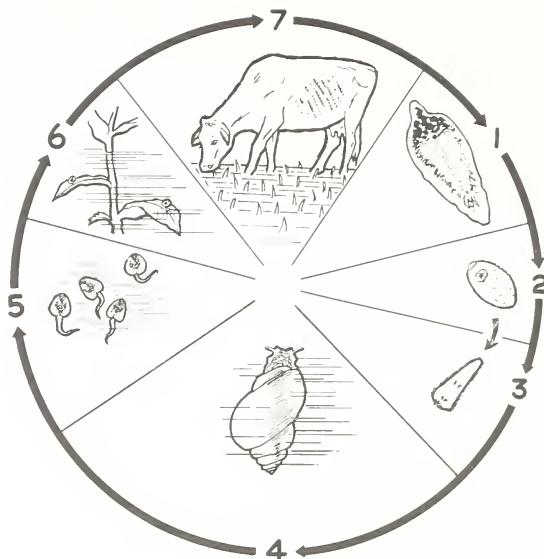
- The milk-white larvae have flat, heart shaped bodies and long tails. They are just large enough to be visible to the unaided eye, but are not noticeable under ordinary conditions. When they escape from the snail, they swim about until they find grass, debris, or plants.
- Larvae lose their tails and form very small whitish, pearl-like cysts. Usually, cysts are attached to grass, but occasionally they float on water. Cattle become infected with flukes when they eat grass or drink water containing cysts. Cysts can remain infective for several months, whether they are in or out of water.
- Immature flukes escape from the cysts and wander through the animal's body cavity for a few days. Then they bore into the liver. As they feed and grow, the flukes destroy tissue. The parasites move into the bile ducts of the liver. Here they mature and begin depositing eggs in 2 to 3 months.

In the Gulf and Southwestern States, a fluke completes one life cycle in about 5 months. In the



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Common liver flukes (stained, natural size).



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Life cycle of the common liver fluke. 1. Adult fluke. 2. Egg. 3. Embryo. 4. Development in snail. 5. Larvae. 6. Cysts. 7. Maturity in animal's body. Eggs, embryos, larvae, and cysts seldom are seen without magnification. (The giant liver fluke develops through similar stages.)

northern Mountain and Pacific States, development takes 6 to 7 months.

Flukes may remain in an animal's body and continue to lay eggs for several years. Some severely infected cattle livers have contained more than 100 flukes.

SYMPTOMS

As the adult flukes destroy tissues, the affected liver becomes grayish, thick, and hard. Stonelike deposits of calcium phosphate may gradually fill the bile ducts and partially block the flow of bile. These changes in the liver's normal function may undermine the animal's health.

In the Gulf States, fluky cattle frequently develop symptoms associated with parasitism. These cattle may be affected by phosphate and

calcium deficiencies and stomach or intestinal worms as well as flukes.

Symptoms of fluke infection include weakness, diarrhea, anemia, loss of condition, and unthriftiness. Fluky cattle may fail to utilize their feed efficiently; in feedlots they may gain weight more slowly than non-infected cattle fed the same type of rations. Sometimes, infected cattle on pastures lose weight rapidly. Milk production of infected cows may drop; weakened animals may not breed.

Outside the Gulf States, cattle do not normally develop marked symptoms—even if they are severely infected with flukes.

DIAGNOSIS

To find out if a herd of cattle is infected, ask your veterinarian or

your State veterinary diagnostic laboratory to make a microscopic examination of fresh cattle feces for fluke eggs. This is a practical and rapid method of diagnosing liver fluke infection in a live animal. Veterinary colleges and departments also may make this examination.

Veterinary meat inspectors may find flukes during routine post mortem examinations of cattle livers.

If eggs or flukes are found, begin control measures at once.

TREATMENT

Hexachloroethane is safe to use in treating fluky cattle. Do not use carbon tetrachloride—the drug recommended to treat sheep—because it frequently poisons cattle.

Hexachloroethane kills adult, egg-laying flukes in the bile ducts of a normal cattle liver. It does not destroy immature flukes in the liver itself or in other parts of the body. In a severely damaged liver the

drug may not kill all adult flukes. Treatment does not repair damaged liver tissue.

Because treatment removes most of the adult flukes, the animals usually regain lost weight and condition quickly.

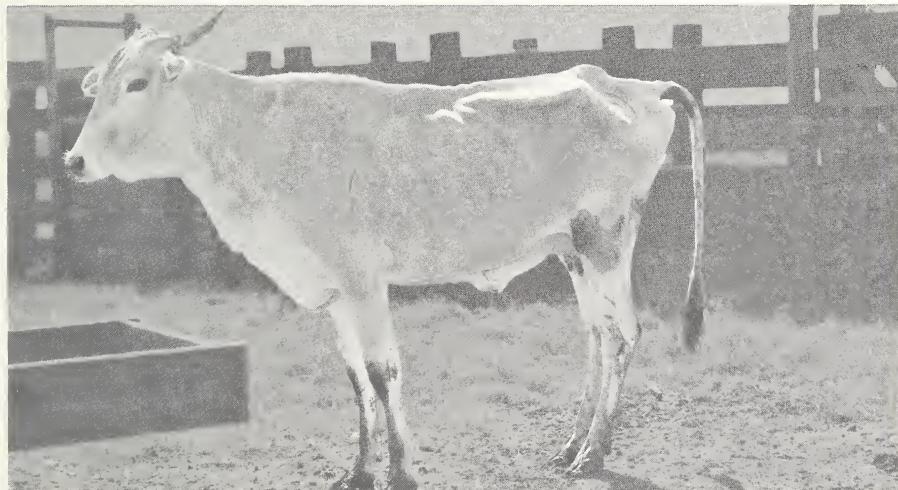
Treatment of cattle will not eradicate flukes from an infested area. Treated animals generally become reinfected when they return to fluky pastures. However, cattle grazing fluky lands usually do not develop symptoms if they are treated regularly with hexachloroethane.

Consult your veterinarian or officials of your State agricultural experiment station about treating fluky cattle. They can advise you about methods that have proved most effective in your area.

TIME OF TREATMENT

In infested areas, treat all cattle over 3 months of age for flukes twice each year, at 6-month intervals.

If possible, give the drug when all flukes in the animal's body are



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In the Gulf Coast area, cattle with common liver flukes appear unthrifty and lose weight rapidly.



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Snails live in wet-weather springs (above, dried up), slow-moving fresh water, mud, marshes, or on pond and stream banks.

mature and have reached the bile ducts of the liver. Under these conditions, flukes are most vulnerable to hexachloroethane.

Generally, cattle are treated in late fall and in late spring—the periods when most flukes will have matured. If flukes mature under unusual weather conditions at another season, treat cattle at that time.

To determine the time when the greatest number of flukes in the body will be mature, add 3 months to the last probable time cattle were exposed to cysts. Usually, animals become infected during wet periods when snails are active and escaping fluke larvae are forming cysts. Cattle seldom are exposed to new fluke infections when snails are underground because of cold or drought. Removal of cattle from fluky pastures for the winter will eliminate exposure to cysts—unless cattle are fed hay containing cysts.

DOSAGES

Treat fluky cattle with a commercial hexachloroethane drench. When prepared, the drench should contain 0.5 gram of hexachloroethane per cubic centimeter. Mix

the suspension according to directions on the label; administer it with a drench syringe.

Follow dosages suggested by your veterinarian. Or give adult cattle about 200 cc. containing 100 grams of hexachloroethane. Use 100 cc. containing 50 grams of the drug for animals between 3 and 24 months.

Do not fast animals before treating.

CONTROL

Destroying Snails

The best way to control liver flukes is to kill their intermediate hosts—snails. When snails are destroyed, the life cycle is broken and flukes cannot mature to infect cattle or other animals.

The snails that act as intermediate hosts for flukes must have water or moisture to live. They burrow into soil during droughts and also overwinter in soil in northern areas. When they emerge during the first warm days following spring rains, snails are most vulnerable. At this time, snails are readily killed by draining or filling wet pastures, or by using a chemical poison—copper sulfate—on pastures. Often, drainage and copper sulfate are used in separate areas of the same range to provide maximum kill of snails.

Drainage

Snails can be eradicated if the wet pastures that they inhabit are permanently drained. If the total area favorable for snail growth cannot be drained, treat in other recommended ways.

Cut drainage ditches deep and wide enough to carry off all water. (If marshes, swamps, and wet spots on pastures are completely dried up, snails will not reappear.) Make

banks perpendicular to ground level so that grass cannot grow on the sides of the ditches. Clean out ditches regularly to keep them open.

Filling

Filling is a practical way to get rid of small, swampy areas.

Copper sulfate

Copper sulfate usually will kill snails within 24 hours after it is applied to their habitat. When used as recommended, copper sulfate normally is not poisonous to man or livestock. It does not affect flukes or cysts.

Bluestone and blue vitriol are common names for copper sulfate. It may be applied as a dust, as a spray, or as crystals. Because the chemical does not kill snail eggs, new generations of snails usually appear after treatment. For this reason, copper sulfate should be applied semiannually—or more often if large numbers of snails appear.

SWAMPY AREAS.—Use copper sulfate to dust swampy or marshy spots, drainage ditches, spring overflows, seepages, margins of water, hog wallows, and large swampy areas not heavily overgrown. Apply the chemical with a hand or power

duster if terrain permits. If large areas require treatment, airplane dusting may be practical.

Dusts should contain copper sulfate powder and a carrier. Prepare in one of the following ways, and apply it at the rate indicated:

1. Kaolin (China clay) as carrier. Mix 1 part of chemical with 4 parts of kaolin. Chemical needed to treat 1 acre: $27\frac{1}{2}$ pounds.

2. Land plaster (gypsum) as carrier. Mix 1 part of chemical with 8 parts of land plaster. Chemical needed to treat 1 acre: $33\frac{3}{4}$ pounds.

3. Sand as carrier. If sand is dry, mix 1 part of chemical with 4 parts of sand; if sand is wet, mix 1 part of chemical with 8 parts of sand. Chemical needed to treat 1 acre: If sand is dry, 20 pounds; if sand is wet, $27\frac{1}{2}$ pounds.

WET PASTURES.—On wet pastures with heavy vegetation, kill snails with a spray containing 0.5 percent of copper sulfate. To prepare the spray, dissolve 1 pound of copper sulfate crystals in a small amount of warm water; add this to each 25 gallons of water and mix. Adjust sprayer for 137 gallons per acre.

STREAMS.—Streams that flow over snail-infested lands may be treated by placing a burlap bag containing large crystals of copper sulfate in headwaters, at dams, or at a high, narrow part of the water course. Use 12 pounds of copper sulfate for each cubic foot per second of flow.

To determine the amount of copper sulfate needed to treat a stream:

1. Find the rate of flow of water in cubic feet per second. To do this, select a uniform section of the stream and mark off 50 feet. Measure the width and average depth of flowing water in this section. Multiply these figures to obtain the area of the cross section in square feet.



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Grass and water in low-lying, wet pastures often are infested with the tiny cysts that produce fluke infection in cattle.

Example

Width of stream: 6 feet.
Average depth: 6 inches ($\frac{1}{2}$ foot).
 $6 \times \frac{1}{2} = 3$ square feet.

Float a chip over the marked section and time its progress to obtain the speed in feet per second.

Example

The chip floats 50 feet in 25 seconds.
 $50 \div 25 = 2$ feet (rate of flow per second).

Multiply the area of the cross section by the speed of the water. The product is the approximate flow of the stream in cubic feet per second.

Example

$3 \times 2 = 6$ cubic feet per second.

2. To get the total amount of copper sulfate needed, multiply the flow in cubic feet per second by 12 pounds, the amount needed for each cubic foot per second of flow.

Example

$6 \times 12 = 72$ pounds of copper sulfate (amount needed to treat stream).

PONDS.—For snail-infested ponds, place large crystals directly in the water. Normally, ponds are treated at the rate of 1 part of copper sulfate to 500,000 parts of water. If the water or area is heavily infested with snails, treat at the rate of 1 part of chemical to 250,000 parts of water. For a 1:500,000 dilution, use $5\frac{1}{2}$ pounds of copper sulfate per acre-foot; for a 1:250,000 dilution, use 11 pounds of copper sulfate per acre-foot.

To obtain acre-feet, multiply the estimated surface area of water in acres by the average depth of water in feet.

CAUTION: Copper sulfate is a pesticide. If used improperly, it can be injurious to man and animals, including fish, and to water plants.

In treating waters stocked with fish, place copper sulfate close to banks. Follow the directions and heed precautions on the label.

If known fluke-infested areas are not drained or treated with copper sulfate, fence cattle out. Place far enough back to exclude cattle from fluke-infested areas.

Good Management

Follow sound management practices to prevent cattle from eating grass or drinking water containing cysts.

Do not feed cattle hay or silage that has been cut from fluke-infested lands.

Control wild rabbits wherever practical. Flukes develop in rabbits in the same way they develop in cattle and sheep. Feces from fluky rabbits contain eggs that can hatch new generations of flukes.

Know fluky areas of your ranges and pastures. Watch for temporary pools and wet spots where snails collect; these areas are most likely to contain fluke cysts. After heavy rains, keep animals out of these areas for several weeks, if possible.

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